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last two classes named are by no means distinct categories from the preceding items of the list, as Carabidæ, Tenebrionidæ, Pentatomidæ, bees, wasps, ichneumon flies, ants, centipedes, millipedes, scorpions and spiders (11 out of 15 categories) are themselves classed by the Poulton school as protected insects. If all of the so-called protected classes of insects were really protected from the attacks of birds, the latter certainly would be hard put to it to find a living. But they do live and feed, I may safely say, without prolonged consideration of the theoretically protected condition of so much of their prey. The special instances of supposedly protected insects being eaten that are pointed out by Mr. Bryant, are the following: "millipedes . . . usually considered to be well protected . . . by certain secretions which produce a pungent odor"; cow killers (*Mutillidæ*); and the very hairy larva of *Euanessa antiopa*.

In a review in the last number of 'The Auk' of one of Mr. Bryant's papers, the writer thoughtlessly did an injustice by contrasting one of Mr. Bryant's statements about conditions in California with conclusions drawn entirely from Eastern experience. This was in regard to food supply being in the last analysis the most important factor limiting the numbers of birds. In the humid east there is no doubt that food supply is *not* of primary importance in determining the numbers of at least the *seed-eating* birds. Regarding a climate where long and continued droughts prevail, a different conclusion is no doubt justifiable. Especially if a drought begins early in the summer after most of the seeds have sprouted, and new ones are not yet formed, the crop of seeds for that and the succeeding year will be very greatly reduced. Under such circumstances it is conceivable that seed-eating birds if present in abundance might have difficulty in finding sufficient food. We know that in Australia where droughts and rainy seasons endure for series of years, that almost the whole bird population shifts from place to place and that with many species, reproduction is carried on only in the rainy districts where food is plentiful.

The reviewer regrets his careless comment on this point, and hopes the present explanation will make clear that his purpose at least is to stick as close to facts as possible.—W. L. M.

Relation of the Turkey-buzzard to Diseases of Live-stock.—In the past few years wide currency in the South has been given to the accusation that Turkey-buzzards spread such diseases of live-stock as hog-cholera, black-leg and anthrax. This scavenger therefore has been threatened with persecution in the land where heretofore it has received the most zealous protection. It is of great interest that the results of a scientific study of "Anthrax of animals in Panama, with a note on its probable mode of transmission by buzzards"¹ show that the transmission of the disease probably never occurs in the way ordinarily supposed, *i. e.* by the voiding of live bacilli in the feces of buzzards. The authors, Drs. S. T. Darling and L. B. Bates, describe their results as follows, beginning with observations on the

¹ Amer. Vet. Rev. 42, No. 1, Oct., 1912, pp. 70-75.

habits of buzzards when feeding on carrion: "They congregate about a dying animal, plucking out the eyes and tearing off soft parts even before death. Thus they pick away the mucosa of the anterior nares, pluck out the eyes and the soft parts around the anus and sheath. As decomposition advances and the tissues soften, the birds crowd into and upon the carcass, literally smearing the decomposed material over their plumage. In the case of an animal dying of anthrax, the tissues contain enormous numbers of bacilli. These in contact with air on the plumage of the bird go into spore formation, and buzzards most certainly act as carriers of infection, by transporting anthrax bacilli and spores from one place to another in this way. Some personal (immediate) contact with animals or pastures would be necessary in this case for infection. If, however, the spores of anthrax bacilli pass intact through the intestinal tract of buzzards, pastures might be infected from the droppings of birds that had fed on animals dying of anthrax.

"The following experiments were carried out to determine the likelihood of that possibility. Three Turkey-buzzards were selected from a lot supplied through the kindness of the Health Officer, Panama, and the Sanitary Inspector at Empire. The buzzards were kept in an isolated room and were given a plentiful supply of drinking water and chopped meat. This meat was thoroughly soaked and mixed with a saline emulsion of anthrax bacilli and spores grown on agar plates. On account of the filthy habits of the birds, it was impracticable to obtain specimens of feces in which food contamination could be ruled out except by holding the birds and inserting a swab or catheter into the cloaca. Abundant material was obtained in this way. Specimens were taken at approximately 12, 36, 60 and 84 hours after feeding. Numerous agar plates were immediately made, but in none was the anthrax bacillus present.

"In order to introduce a maximum number of the bacilli, the experiment was repeated with the following variation: Instead of mixing food and cultures a rubber catheter was introduced into the gullet of the buzzard and about 20 c. c. of a very heavy saline emulsion of anthrax bacilli and spores were injected through a catheter into the stomach by a Luer syringe. The buzzards were watched to see that they did not regurgitate or otherwise unlawfully dispose of the dose. Agar plates were made as before, and anthrax bacilli were found to be absent. Shortly after these experiments were completed the birds were killed and cultures taken from various portions of the intestinal tract. Anthrax bacilli were absent.

"We conclude from this experiment that pastures and other locations cannot be infected by buzzards through the agency of droppings, but require more intimate contact.

"The experiment just outlined illustrates the very powerful digestive mechanism of buzzards for bacteria, and when we consider that the food of carrion birds is sometimes almost wholly bacteria and bacterial products, we are not surprised at the facility with which they appear to destroy all bacterial species" (pp. 74-75).

From the above experiments it is clear that the possibility of buzzards

transmitting anthrax is small. Drs. Darling and Bates show that it is practically impossible by agency of the dejections of the birds, and it is obvious that the other possible mode requiring actual bodily contact of the buzzards with live-stock is not likely to be in operation often.

An investigation of "Carrion feeders as disseminators of Anthrax or Charbon,"¹ by Dr. Harry Morris, of the Louisiana Agricultural Experiment Station, confirms the findings of Drs. Darling and Bates with regard to the destruction of the disease bacilli by the digestive processes of the buzzard. Dr. Morris says "no anthrax was found in the posterior part of the digestive tract, none being found beyond the stomach, and but little in that organ. These experiments show quite conclusively that the anthrax bacteria do not pass through the digestive tract of the buzzard and consequently are not disseminated in the droppings of these scavengers." (p. 6.)

It was found that anthrax bacilli remain alive upon the beaks and feet of buzzards for at least 48 hours. The author therefore thinks that pasturage and water might be contaminated in this way, and thus become sources of infection. He says anthrax spores will live in water for years without decrease in virulence. Fortunately Dr. Morris included other carrion feeders in his experiments. It was found that (1) "Anthrax spores are not destroyed in the digestive tract of the dog. They were found in the feces six days after anthrax had been fed." (2) "The feces of the hog contained anthrax for a period of five days after eating the spores." (3) "Anthrax was found in the feces of the cat for a period of four days after eating anthrax spores." (4) "Anthrax is not destroyed in the digestive tract of the opossum." (5) "We were unable to produce anthrax in chickens, but the spores were not destroyed in the digestive tract. The feces contained anthrax for a period of forty-eight hours after eating spores." (6) "Anthrax is present on the bodies and feet and the excrement of flies that have been feeding on infected carcasses." (p. 16.) "What is the importance of this fact? Cobb has shown that a fly will defecate on an average of once every five minutes, or twelve times an hour. If anthrax spores are excreted for a period of ten hours — and it has been proven that they are carried for a much longer time — in that time the fly will defecate one hundred and twenty times. The fly after feeding on an infected carcass would doubtless deposit these germ-laden "specks" over a considerable area and may start a number of centers of infection." . . .

"Knowing that the fly carries anthrax in the digestive tract and on its body, it is possible that it is one of the chief causes of our severe outbreaks of anthrax. Quite often carcasses are allowed to remain where the animals die, and in these cases the flies eat on the anthrax material, spreading the infection over considerable areas." (p. 13-14.)

It would appear, therefore, that the buzzard has much the best record of any of the carrion feeders studied, as it is the only one that does not, distribute anthrax bacilli in its feces. Some of the other animals, as the dog,

¹ Bull. 136, La. Agr. Exp. Sta., Nov. 1912, 16 pp.

opossum and swine are just as apt to contaminate water as the buzzard (pasturage also in the case of hogs), and the dog and chickens are far more likely to carry infection by bodily contact with other domestic animals than the buzzard. It seems evident therefore that at the same time that steps are being taken to greatly reduce or exterminate a wild bird — the buzzard — which may possibly play a minor part in the transmission of anthrax, farmers are harboring several domestic animals that have far greater possibilities as spreaders of the disease. The fact that the disease may be carried by flies is more than sufficient to explain the most severe epidemics.

However, the real fault lies with none of these animals, but with man himself. Dr. Morris says "we believe that the neglect to properly dispose of anthrax carcasses is, without doubt, the factor most responsible for the continuance and spread of anthrax." (p. 16.) In accordance with the most primitive ideas of sanitation, the cleaning up of all kinds of matter likely to become the source of disease, has too long been left to the buzzard, opossum and the domestic scavengers in the South. It is inexcusable to wage warfare upon a bird which cannot harm us unless we give it the opportunity by our own criminal negligence. Let the farmers bury deeply all animals dying on their premises, doing this as promptly as possible after death, and there will soon be no reason for laying blame for the transmission of stock-diseases upon any animal, wild or domestic.—W. L. M.

Cassinia, 1912.¹ — Under the new regime 'Cassinia' remains the same interesting yearbook of an ornithological club that evidently is very much alive. We note that Mr. Stone, the former editor, is the principal contributor, three articles being credited to him. One is a sympathetic sketch of the life of General George A. McCall, who was one of the chief aids to Cassin in the preparation of his book on the 'Birds of California and Texas.' Mr. Stone presents also the customary summary of observations on the migration of birds in the vicinity of Philadelphia. A slightly larger number of migrants arrived later than the average date of arrival than earlier. Attention is called to the greater variation in this respect of the earlier migrants. Two striking features pointed out are the scarcity of Bluebirds and the unusual abundance of Goldfinches in April.

Another article on migration, by Professor W. W. Cooke, contrasts the dates of arrival in 1791 as recorded by Dr. Benjamin S. Barton with the average dates for recent years. There is no significant variation in the lists at opposite extremes of more than a centenary period. Barton's publication contains the earliest record of the Swallow-tailed Kite for Pennsylvania, one of the very few records of the Carolina Parakeet for that state and the only one for New York.

Mr. Julian K. Potter contributes a 'Preliminary Report on Roosting Habits of the Purple Grackle in the Delaware Valley.' He finds that no

¹ Cassinia. A Bird Annual. Vol. XVI. Philadelphia, 1912, 72 pp.